

# **Every Student Counts**

## **Professional Development Guide Component Two for Elementary School Level**

### **Number & Operations and Algebra Teaching Counting, Comparing, and Place Value**

**Year 1 - Day 1**

Iowa Department of Education



## Teaching Counting, Comparing, and Place Value

### Unit Overview

Activity	Description	Time	Materials
1. Assessing student understanding of number	Participants learn three assessment tasks, view a video of children being assessed, and practice giving the following three assessments: <ul style="list-style-type: none"> <li>• Conservation of number</li> <li>• Counting objects</li> <li>• Place value</li> </ul>	55 min.	Video: <i>Math Time: A Look At Children's Thinking</i> by Kathy Richardson Unifix cubes; Pre-made assessment packets; Overheads 1-3; Handouts 1-3
2.A predominantly constructivist approach for counting, comparing and place value	Participants experience activities for promoting 1 to 1 correspondence, and conservation of number, for developing number sense and number relationships, and to develop a sense of quantity for numbers to 100 using tens and ones.	45 min.	<i>Developing Number Concepts</i> by Kathy Richardson - Books 1 and 3; Creation Station cards; Number Puzzle cards; Unifix cubes, bowls; dot cubes and number cubes; BLM #1, BLM # 7-12, 34-40, BLM#63
3.A more behaviorist approach for place value	Participants name numbers adjacent to given numbers on a 0-99 chart. Given a number on the 0-99 chart, they represent the given number on the place value mat using base ten blocks (tens, and ones). They devise questions to illustrate the six translations among model, oral, and symbol using hundreds, tens, and ones blocks on a place value mat.	30 min.	0-99 pocket chart and red and green colored transparent overlays, static 100s chart; prediction window cards, Handout 4; Handout 5 a-b; Overheads 4 and 5; place value mat (hundreds, tens, and ones), base ten blocks (9 hundreds, 9 tens, and 9 ones)
4. Number and Counting	Participants will experience the Bridges Unit “Number and Counting”	140	See materials listed in Bridges guide.

## Summary of Session:

In the first activity, participants learn how to conduct three performance assessments for determining the understanding of young children about counting and place value. They view a video showing the administration of the assessments and they practice giving three assessments:

- Conservation of Number Assessment
- Kathy Richardson's Counting Objects Assessment
- Kathy Richardson's Place Value Assessment

In the next activity, participants become familiar with a student-centered, constructivist approach to teaching the number sense and number relationships. They experience several mini-lessons from *Developing Number Concepts* by Kathy Richardson - Books 1 and 3 for promoting

- 1 to 1 correspondence
- Number sense and number relationships
- The development of a sense of quantity for numbers to 100, using tens and ones

In the next activity, participants use a 0-99 pocket chart. They name numbers adjacent to given numbers on a static hundreds' chart. Given a number on the hundreds' chart, they represent the number on place value mats using base ten blocks (tens, and ones). They devise questions to illustrate the six translations among model, oral, symbol using hundreds, tens, and ones blocks on a place value mat.

Finally, the participants use number grids to find patterns as part of the Bridges Unit “Number and Counting.”

## Goals:

- To observe and learn how to conduct 1 on 1 performance assessments for counting and place value;
- To experience several constructivist mini-lessons for developing counting and place value;
- To learn how to introduce and use several, teacher-centered models for classroom instruction on place value;
- To apply the six model-oral-symbol translations for base ten blocks;
- To develop confidence in using several resources for teaching counting, comparing, and place value.

## Planning ahead for the Session:

**Read the Materials.** Read the following pages from the Staff Developer's Guide for this section. Read Bridges Handbook pages 1-14.

**View the tapes.** Look at the two videos from *Math Time: A Look At Children's Thinking* by Kathy Richardson. There is also a tape available for the Bridges Unit on Patterns on the 100's board.

**Gather the Materials.** Each participant will need 20-30 unifix cubes with at least 10 of one color and 8 of another, pre-made assessment packets, a bowl (margarine tub), a dot cube, an number cube, Creation Station cards, Number Puzzle cards, a place value mat (hundreds, tens, and ones), Base ten blocks (9 hundreds, 9 tens, and 9 ones). The staff developer will need a 0-99 pocket chart and red and green colored transparent overlays (20 of each), and prediction window cards.

**Prepare the Handouts and Overheads.**

- Handout 1 - Conservation of Number
- Handout 2 - Kathy Richardson's Counting Objects Assessment
- Handout 3 - Kathy Richardson's Place Value Assessment
- Handout 4 - Hundreds Chart
- Handout 5 a-d – Missing Numbers from the Hundred's Chart

Make one copy of Handouts 1-5d for each participant.

- Overhead 1 - Conservation of Number
- Overhead 2 - Kathy Richardson's Counting Objects Assessment
- Overhead 3 - Kathy Richardson's Place Value Assessment
- Video Overhead - Counting, Comparing, and Place Value
- Overhead 4 - Model-Oral-Symbol
- Overhead 5 - Hundred's Chart

## Activity 1-Assessing student understanding

### Activity Synopsis:

Participants will learn the assessment tasks, view a video of children being assessed, and practice giving the following three assessments:

- Conservation of number
- Kathy Richardson Beginning Number Concepts: Focus on Counting Objects
- Kathy Richardson Place Value Concepts: Focus on Tens and Ones

### Materials:

Assessment recording sheets overheads

1. Conservation of number
2. Focus on counting objects
3. Place value: Focus on tens and ones

Video - *Math Time: A Look At Children's Thinking* by Kathy Richardson

Pre-made assessment packets

Conservation of number

- recording sheet
- 2 colors unifix cubes-10 of one color/ 8 another

Counting Objects

- Assessment sheet
- 20-30 unifix cubes

Place Value

- assessment sheet
- 30-50 unifix cubes

### Time:

55 minutes

### Introduction to the Session:

Discuss with the participants the importance of individual assessments used to gather information on student understanding of concepts.

Say something like:

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**You will be seeing three individual assessments. The information gathered from the data will help teachers to plan lessons according to student need and understanding. The assessments also allow teachers to formulate an overall focus on the content that supportive lessons will provide. The assessments are devised in a pre/post test format to monitor student growth as the unit closes.**

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## Conducting the Activity:

### Assessment #1- Conservation of Number Task

This task is modeled after Piaget’s research. Research suggests that children need to have developed conservation of number before formal addition and subtraction can begin. This task assesses if children understand that the quantity does not change when the objects are moved, rearranged, or hidden. It is important that children understand that quantity changes only if more is added or taken away from the number. Perceptual miscues are in this task to see if the child is ruled spatially rather than logically.

- Pass out assessment sheet and materials packet.
- Demonstrate the task on the overhead
- Have participants lay out the set of 8 cubes about an inch apart.
- Having participants take the role of the student ask them to take the set of 10 cubes.

Say something like:

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**Why do you give the student 10 cubes and not 8?**

The task continues in the following manner:

Ask the student to make a row of blue cubes so there is one blue cube for every red cube.

If the student can match, continue with task. If not, terminate the task.

To continue, reaffirm that there is one blue cube for every red cube.

Then move your line of cubes to a pile.

Ask, “*Are there more blue cubes, red cubes, or the same number?*” “*Why?*”

Say something like:

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**What would be sample responses that students might give?**  
**What is the most logical answer?**

Sample responses

- There are more blue because my line is longer.
- There are the same number because I matched them.
- Child recounts cubes then says they are the same.

The task continues in the following manner:

Take your cubes and spread out into a line that looks longer than the students.

Ask, “*Are there more red cubes, blue cubes, or the same number?*” “*Why?*”

Again discuss possible responses.

Discuss implications from the data. Say something like:

- 
- **What types of experiences do the students need?**
  - **Are all students at the same level?**

- Does the planned lesson meet all the students need?
  - Does the lesson promote conservation of number?
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Possible implications:

- Students will need multiple counting experiences with varying types of manipulatives.
- Students also need opportunities to match corresponding sets.
- Rarely does a classroom have children at the same developmental level. This does not mean that children need different tasks, rather each activity needs to be able to be presented at a variety of levels. This can be done by changing the number of objects used or extending the child with appropriate questioning techniques.

## **Assessment #2- Beginning Number Concepts: Focus On Counting**

Pass out Beginning Number Concepts Task Packet.

Say something like:

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**In this task the child will be presented with a pile of 25-30 counters and is asked to first estimate and then to find out how many. After the child has counted successfully, he or she is asked to tell how many there are when one counter at a time is added and then when one counter is taken away.**

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Demonstrate on the overhead the assessment procedures (Overhead 2) to follow in giving this task. Call attention how to mark your observations in a pre/post test format.

While you are demonstrating you might ask the following questions:

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**Should you tell the child if they are incorrect and ask them to try again?  
Should you praise the child when they give a correct response?**

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Responses:

In an assessment you may praise a child's work effort, but not their answer. You would not tell a child they are incorrect during a written test and ask them to change it. The purpose of this assessment is to gain valuable information to help you instruct your students in mathematical concepts.

After demonstrating the task, watch the video.

Discuss not only the information gathered from the task, but this type of task as opposed to traditional assessments.

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**How would this information guide your instruction?  
How is this information different from a standard written assessment?  
Is this task similar to any task found in reading?**

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Response:

This type of assessment is similar to running records and concepts of print survey.

### **Assessment #3- Place Value Concepts: Focus on Taking Numbers Apart**

Pass out Place Value Task assessment packet.

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**In this task the child is presented with 35-40 counters and asked to first estimate and then find out how many tens and ones there are. After the child has determined how many tens and ones they are, they are asked a series of questions to determine their understanding of conservation, counting by groups and adding or subtracting ten.**

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Demonstrate on the overhead the assessment procedure (Overhead 3) to follow to give this task. Pay close attention to the different types of responses listed.

Discuss the following questions:

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**What grade level do you think this would fit?**  
**How does this task relate to the Counting Objects Task?**  
**How long would it take to give this task to your whole class?**

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Watch the video.

If there is time have the participant's partner up and practice giving the tasks to each other.

## **Activity 2: A predominately constructivist approach for counting and comparing**

### **Activity Synopsis:**

Participants will experience activities for promoting:

- 1 to 1 correspondence and conservation of number
- number sense and number relationships
- the development of a sense of quantity for number to 100 using tens and ones

### **Materials:**

*Developing Number Concepts Book 1: Counting, Comparing and Pattern* by Kathy Richardson

BLM #1

BLM #7-12, 34-40

BLM#63

Unifix cubes

Dot cubes

Number cubes

Plastic bowls

Place value boards

### **Time:**

45 minutes

### **Introduction to the Session:**

Say something like:

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**Teachers can support the development of understanding by presenting planned and focused experiences and by interacting with the children as they work.**

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In this session participants will actively experience lessons that engage student learning and behaviors. Close attention to questioning techniques and relationship to process standards will be referred to throughout the activities. Tell the group that children's first experience with numbers influence the way they deal with mathematics for the rest of their lives. Teaching for understanding builds the foundation that children will need to become mathematicians of the future.

To begin, say something like:

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**The first activity is from *Developing Number Concepts: Book One* by Kathy Richardson.**

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Distribute the book to participants.

## **Conducting the Activity:**

### **Counting and Comparing**

Pass out unifix cubes, bowls and dice.

These lessons are good to do together because it shows the developmental sequence the children will need to go through with counting. Each lesson could be done separately or done together depending on the needs of your students. Walk the participants through these for activities. At the end of the one more/ one less activity ask how many would we have if we added 10 more. Refer to the lessons on the following pages for more detailed information on lesson delivery.

- Count and Dump pg. 28
- Making Towers pg.29
- Making Matching Tower and Making Towers with One More or One Less (concept preview of adding 10 more) pg 45

Say something like:

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**How does the assessments we learned earlier relate to the activities?**  
**Why do we ask how many 10 more would be if it's not in the lesson?**

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### **Counting, Comparing Larger Numbers**

Pass out unifix cubes, BLM 7-12, BLM 34-40

Tell the participants that the following activities all help children to continue practicing number concepts and relationships between numbers. The natural progression of counting objects, comparing and ordering objects and then determining how many more or how many less will be modeled in these lessons.

- Creation Station pg. 52-53
- Shape Puzzles pg. 60
- Comparing Shape Puzzles pg.165
- Sorting Shape Puzzles pg.68

### **Place value**

Pass out unifix cubes, place value mats, and precut shape puzzles

Tell the participants the following lessons focus on having children count and organize numbers into tens and ones. Notice how the questioning techniques are similar to those of the earlier activities. Students will develop a sense of quantity; recognize the value of organizing numbers into tens and ones. The activities can be made more challenging for the students by asking them to make comparisons between quantities.

- Rearrange It: Breaking Up Trains into Tens and Ones pg 70
- Rearrange it: Finding All the Ways pg 70-71
- Rearrange It: How Many Cubes pg. 72
- Rearrange It: Breaking Up Tens pg. 73
- Build It Fast pg 73
- Paper Shapes pg. 81-82

### Activity 3 - A more behaviorist approach for place value

#### Activity Synopsis

Participants build a 0-99 pocket chart. They play "Guess My Rule" using rules that describe a group of numbers on the chart. They name numbers adjacent to given numbers on a static hundreds' chart. Given a number on the hundreds' chart, they represent the number on place value mats using base ten blocks (tens, and ones). They devise questions to illustrate the six translations among model, oral, symbol using street addresses and hundreds, tens, and ones blocks on a place value mat.

#### Materials:

0-99 pocket chart and red and green colored transparent overlays, static hundred's chart, prediction window cards, grease pencil, Handout 4 - Hundred's Chart; Handout 5a-5d - Hundred's Chart Activity Sheets, place value mats (hundreds, tens, and ones), base ten blocks (9 hundreds, 9 tens, and 9 ones) for each participant, Overhead 4 - Model-Oral-Symbol

#### Time:

30 minutes

**Introduction to the Session:** Describe the content of this session and introduce the first activity.

Say something like:

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**We are going to look at some teacher led, whole group lessons for place value for 1 to 3 digit numbers. We will be using a 0-99 pocket chart, a static hundreds chart; place value mats, and base ten blocks.**

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To begin,

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**This first activity is from Math By All Means: Place Value by Marilyn Burns.**

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#### Conducting the Activity:

##### 0-99 Chart

- Display a hundreds' pocket chart with the numerals from 0 to 15 inserted in the first 16 pockets.
- Distribute random numeral cards from the remaining cards to participants and ask them to place each card in the correct spot according to the established pattern. As volunteers place their numerals, ask them to explain their reasoning for the placement.
- Discuss possible student miss-steps while a volunteer completes filling in the rest of the numerals.
- Show how to use colored transparent overlay squares for a problem-based instructional task to come later.

### **Static hundreds chart**

- Switching to the static hundreds chart, use prediction window cards and a grease pencil to predict the numbers that are adjacent to random numbers on the chart. Have volunteers complete the missing squares and give the reasons for their answers.
- Pass out Handout 5 a-b and discuss appropriate grade level/student population for its use. Possible responses would be second grade average population or third or higher for special needs students.

### **Base ten blocks**

- Pass out a place value mat and base ten blocks to each participant.
- Pick a random 2-digit number and show it with a prediction window card on a hundred chart or 0-99 chart.
- Ask participants to show the number using tens and ones blocks on a place value mat.
- Display Overhead 4 - Model-Oral-Symbol. Using random 3-digit numbers such as house addresses, ask participants to state questions illustrating the six translations for model-oral-symbol.

Here are some possible responses

How do you write this house address number shown with the base ten blocks? (model to symbol) How do you read this house address number shown with the base ten blocks? (model to oral) Show Susie's house address number that I have written on the board with your base ten blocks. (symbol to model) How do you read this house address number that Michael wrote on the board? (symbol to oral) etc.

### **Base ten blocks continued**

- Starting with a random 3-digit number like 386, have participants show the number with base ten blocks on their place value mats and cover the mats with a sheet of scratch paper. Next tell them to slip an additional ten on to the mat and predict on a sheet of scratch paper the new number shown. (396)
- Continue with adding and subtracting multiples of ten and hundred.
- Extend by asking, "If we start with 87 on the mat, what would we need to add or subtract to get to 47? (subtract 4 tens) Then if we have 47 on the mat, what would we need to add or subtract to get to 27? (subtract 2 tens) ...next to get 127? (add one hundred) ...next to get to 128? (add 1 one) etc.

Say something like:

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**What is the value of this activity for building place value concepts?**

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Here are some possible responses.

Students learn that adding one block changes one place value so that place values are thought of as units. Many times when children are asked, "How many tens are there"? (in two bundles of ten) They reply, "twenty".

## Activity Summary for Counting, Comparing, and Place Value

Say something like:

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**How does the behaviorist approach vary from the constructivist approach shown earlier?**

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Here are some possible responses.

The latter activities are teacher-centered. The teacher directs the students in what to do, does not provide choices or leveled activities or different time schedules for different needs. The constructivist approach depends on the expertise of the teacher in forming questions in response to student concept development as opposed to a preset list of questions for the whole class.

Say something like:

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**Which process standards have been used in the last activity? How?**

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Here are some possible responses.

- The Representation Standard is shown when students model with unifix cubes and with base ten blocks and the model-oral-symbol translations.
- The Communication Standard is illustrated when students explain their thinking orally.
- The Connection Standard is used when students transfer from single digit counting and comparing to multiple-digit and when they translate from the hundreds' chart to the base ten blocks and also when they use examples of 3-digit numbers from everyday life (e.g. house numbers).